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Suya

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[54] **SHEET FEEDING DEVICE**

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[73] Assignee: **Fuji Photo Film Co., Ltd.**, Kanagawa, Japan

[21] Appl. No.: **67,582**

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[30] **Foreign Application Priority Data**

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Dec. 14, 1990 [JP] Japan 2-402477
Dec. 14, 1990 [JP] Japan 2-402478

[51] **Int. Cl.**[5] **B65H 3/46**
[52] **U.S. Cl.** **271/104**; 271/161; 271/167
[58] **Field of Search** 271/107, 91, 92, 104, 271/121, 124, 167, 106, 161, 20, 22, 98, 105

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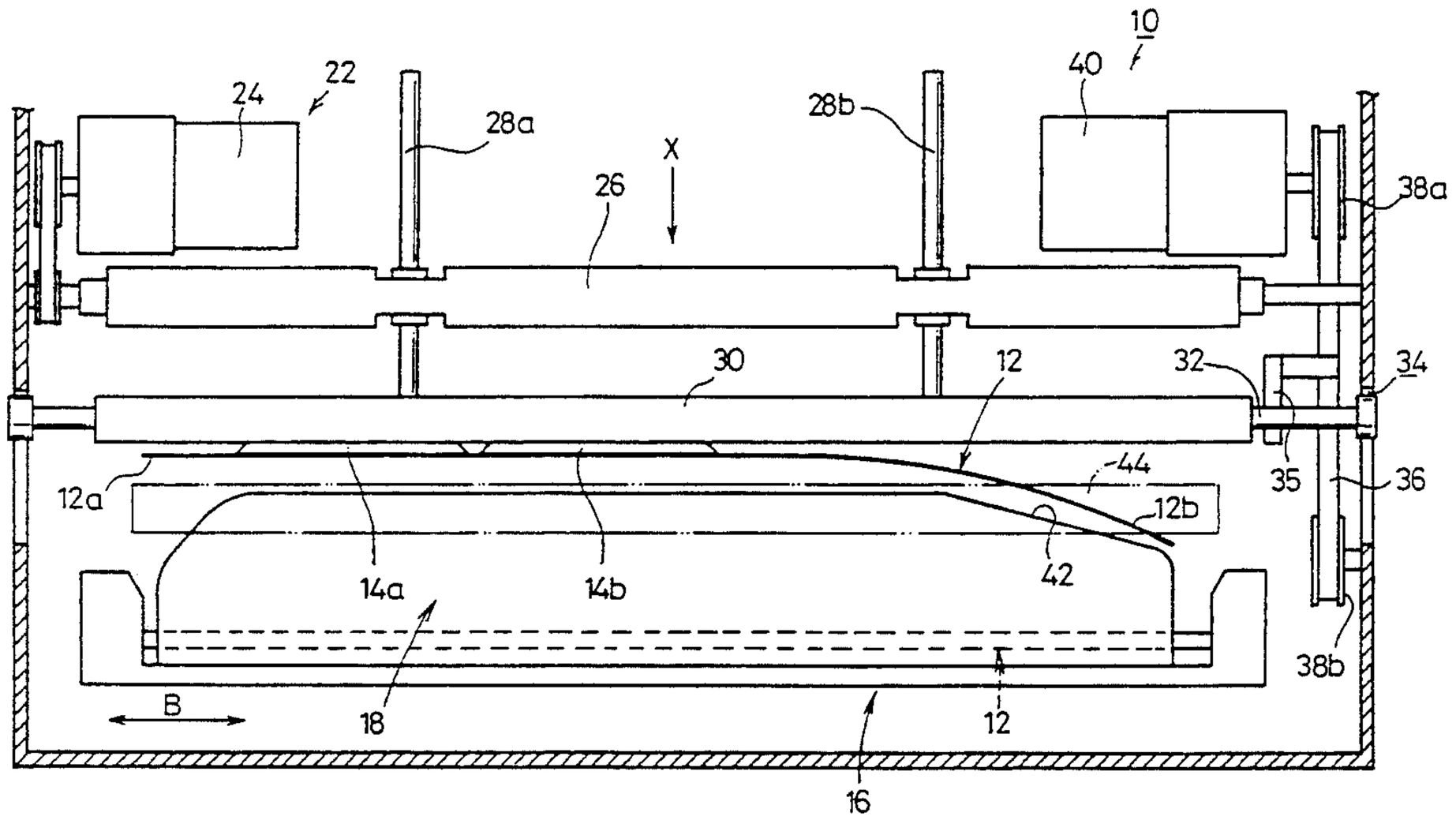
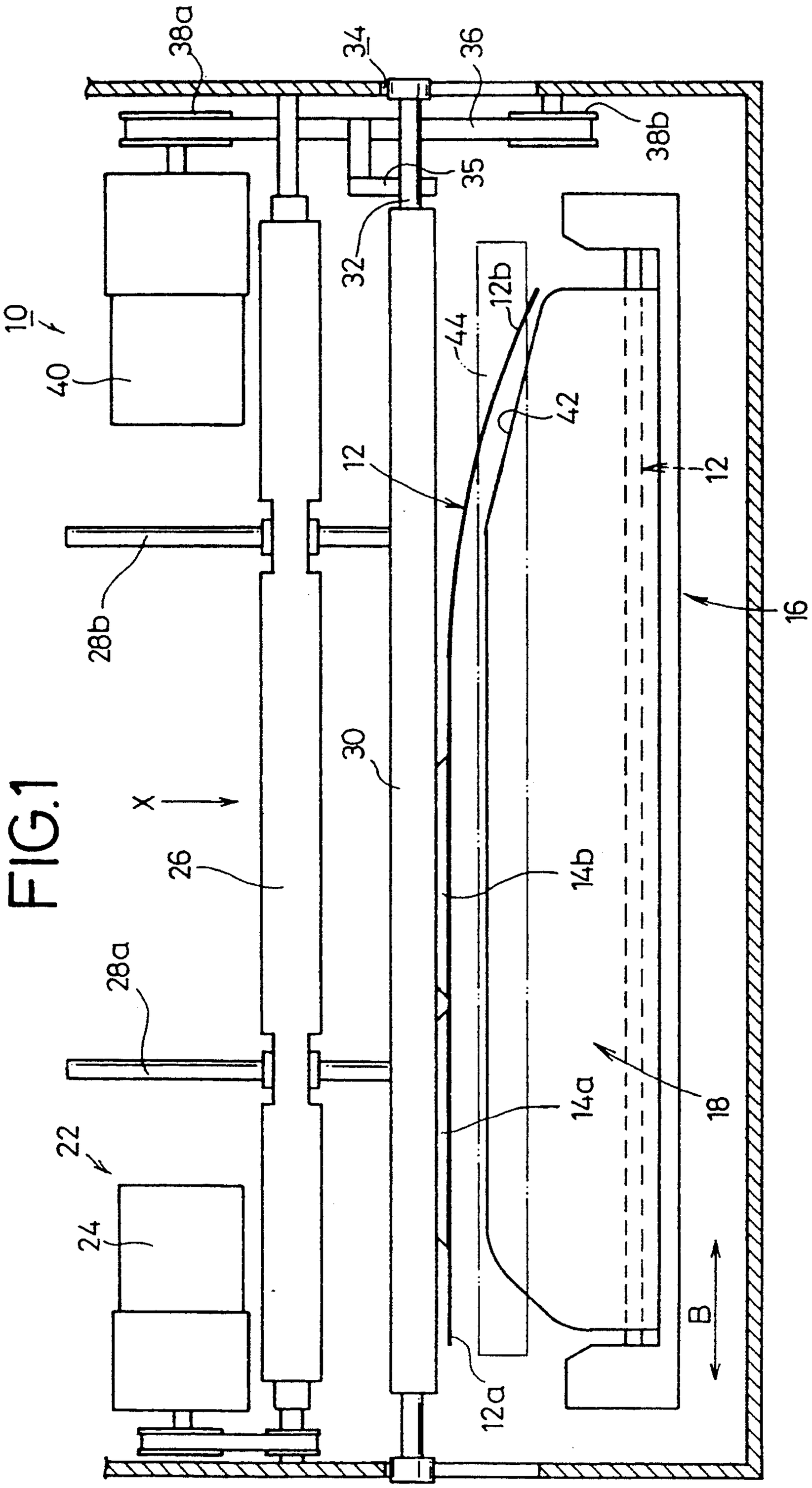
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak & Seas

[57] **ABSTRACT**

Disclosed herein is a device for feeding sheets, one by one, from a stack of sheets stored in a sheet placement unit. The sheet feeding device basically comprises suction cups or pads facing one end of the edge of an uppermost sheet of the stacked sheets, for taking out the uppermost sheet, an engaging member located at the sheet placement unit, for supporting the leading ends in the withdrawal direction of the stacked sheets, and a roller disposed near the engaging member and positioned to face a cut-away portion in a portion of the engaging member facing the opposite end of the uppermost sheet, the opposite end being spaced away from the suction pads. The cut-away portion is formed to prevent the opposite end of the uppermost sheet from contacting with the engaging member due to hang down of the uppermost sheet. In addition, the cut-away portion is inclined downwards toward the opposite end of the uppermost sheet from the one end thereof. The engaging member has a recess portion formed in a portion facing the opposite end of the uppermost sheet along the direction of the thickness of the engaging member in order to form a space between the uppermost sheet and the engaging member.

6 Claims, 9 Drawing Sheets

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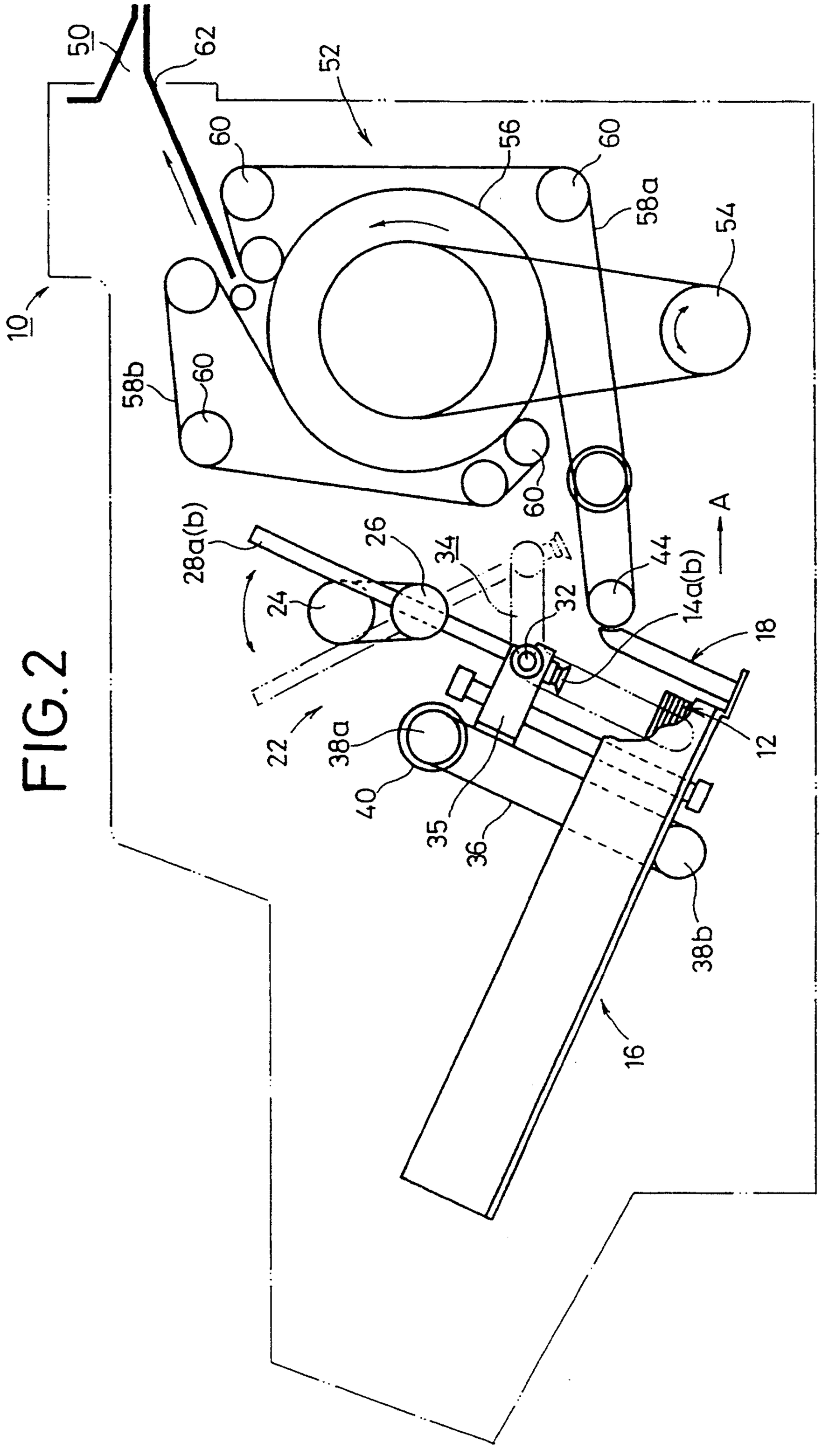
14b
14a
18
22
24
12a
B

FIG.1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50
62
52
60
56
60
58a
54
58b
60
60
28a(b)
26
34
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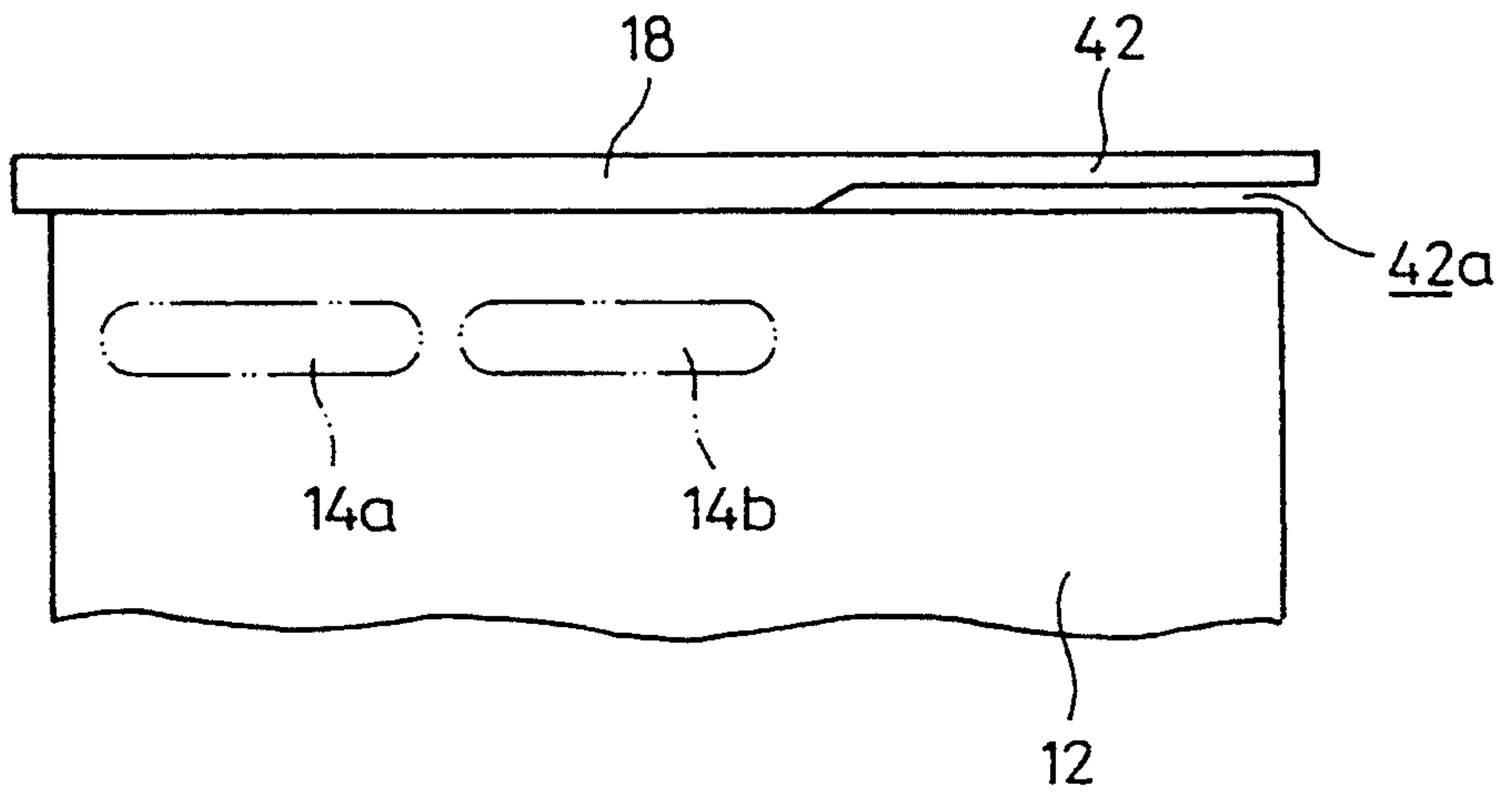
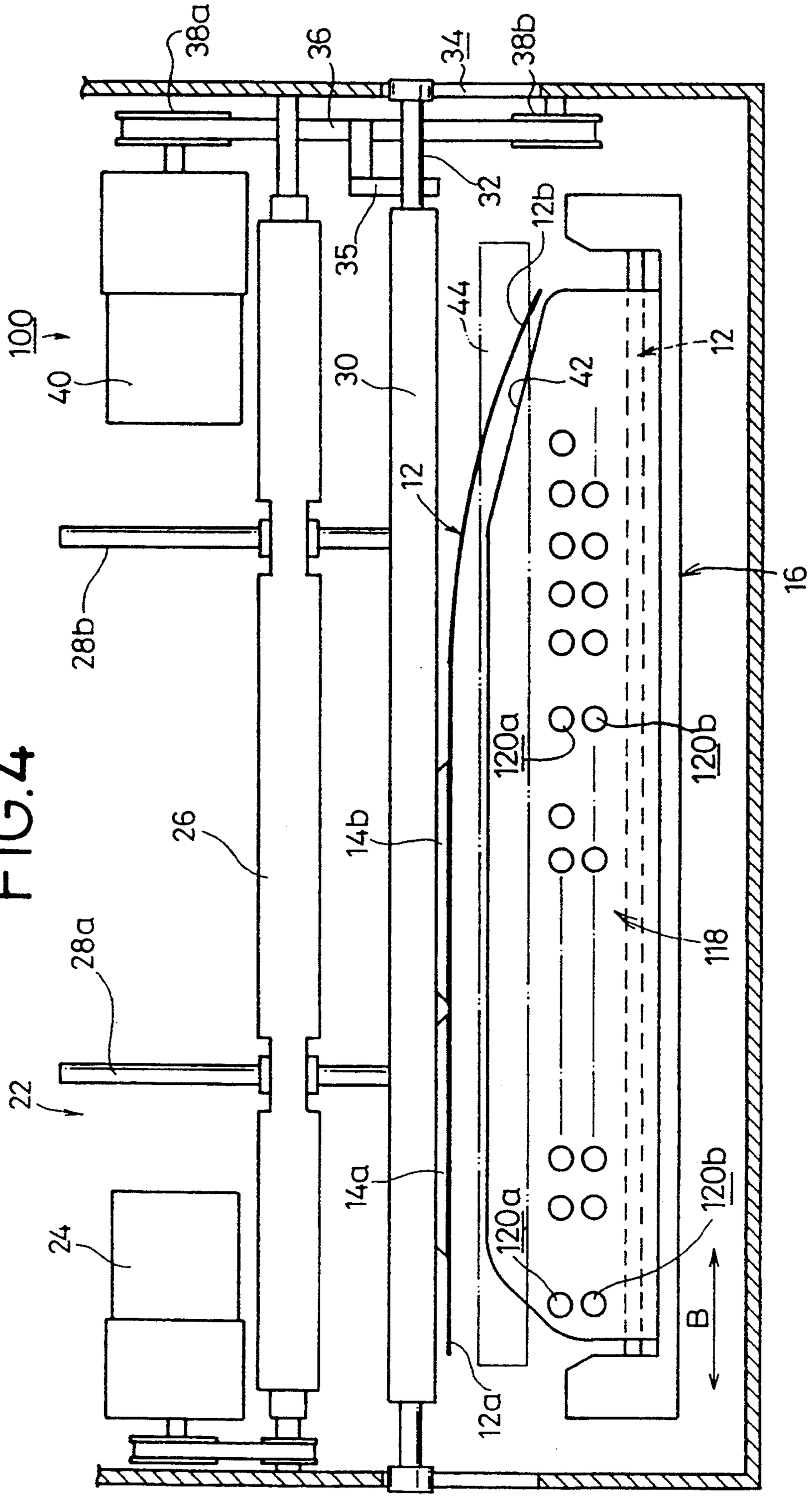
32
44
14a(b)
A
18
22
38a
12
40
35
36
38b
16

FIG. 2

FIG.3

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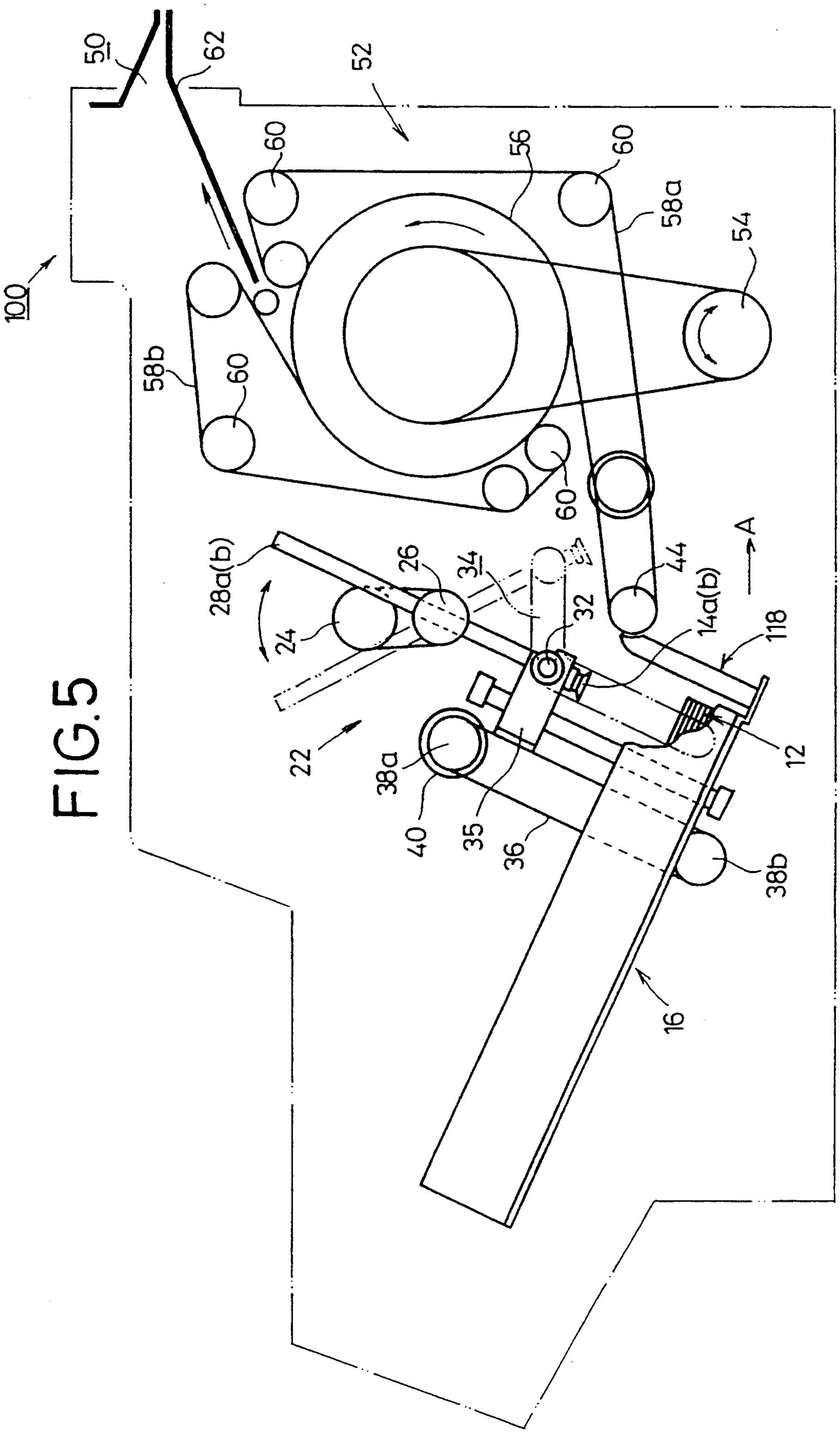
118
14a
120a
120b
24
12a
B

FIG.4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26
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24
32
22
12
38a
40
35
36
38b
16

FIG.5

FIG.6

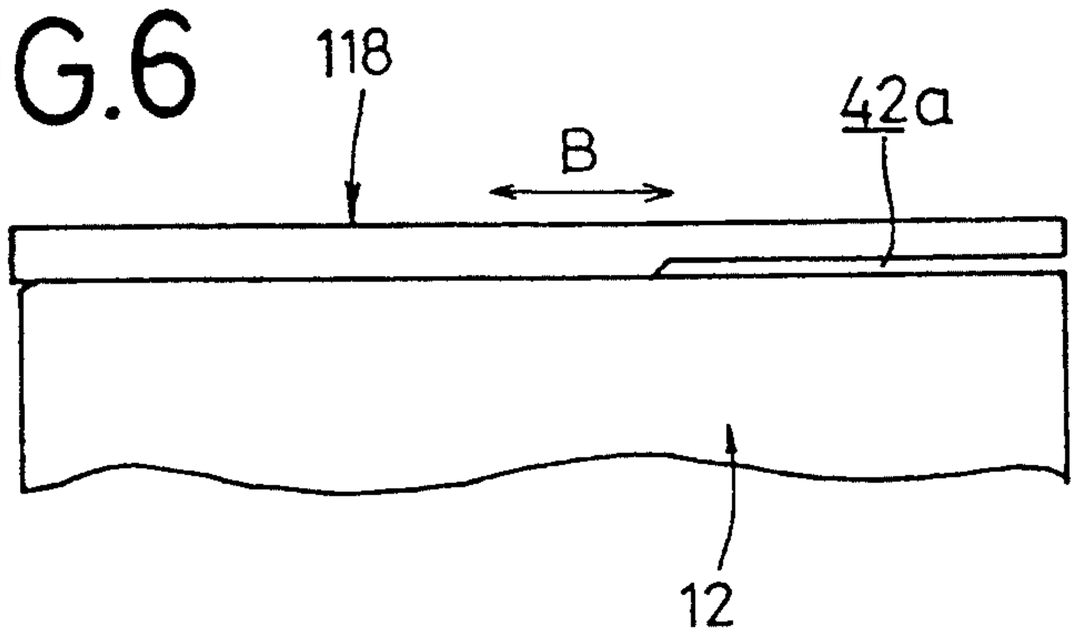


FIG.7

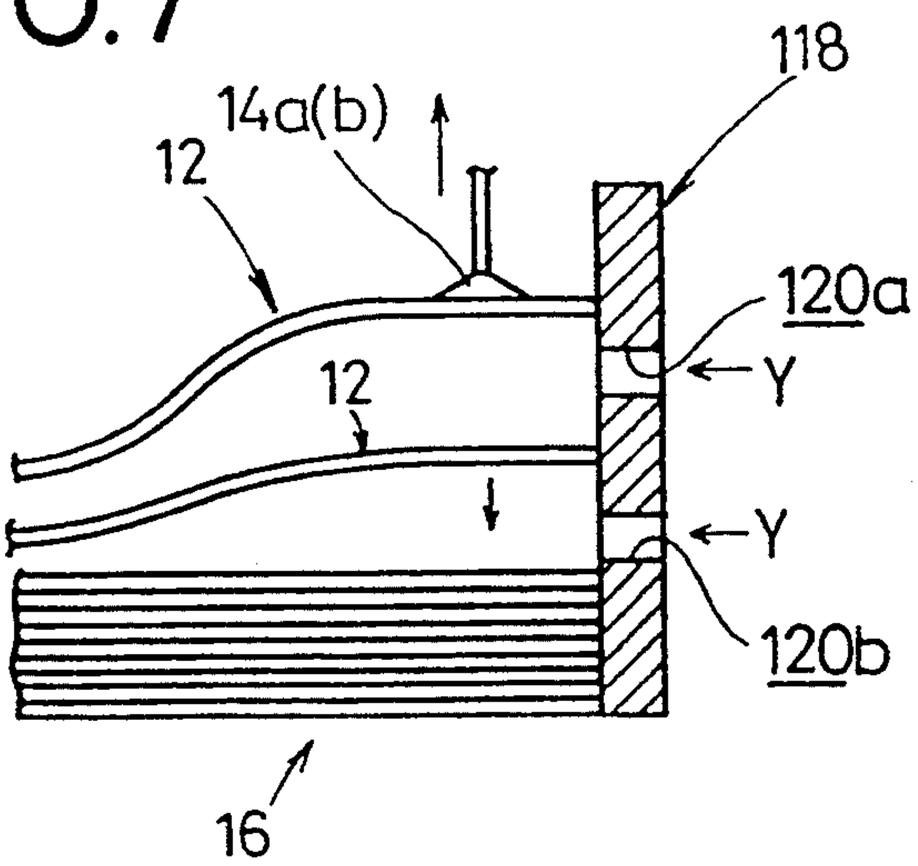
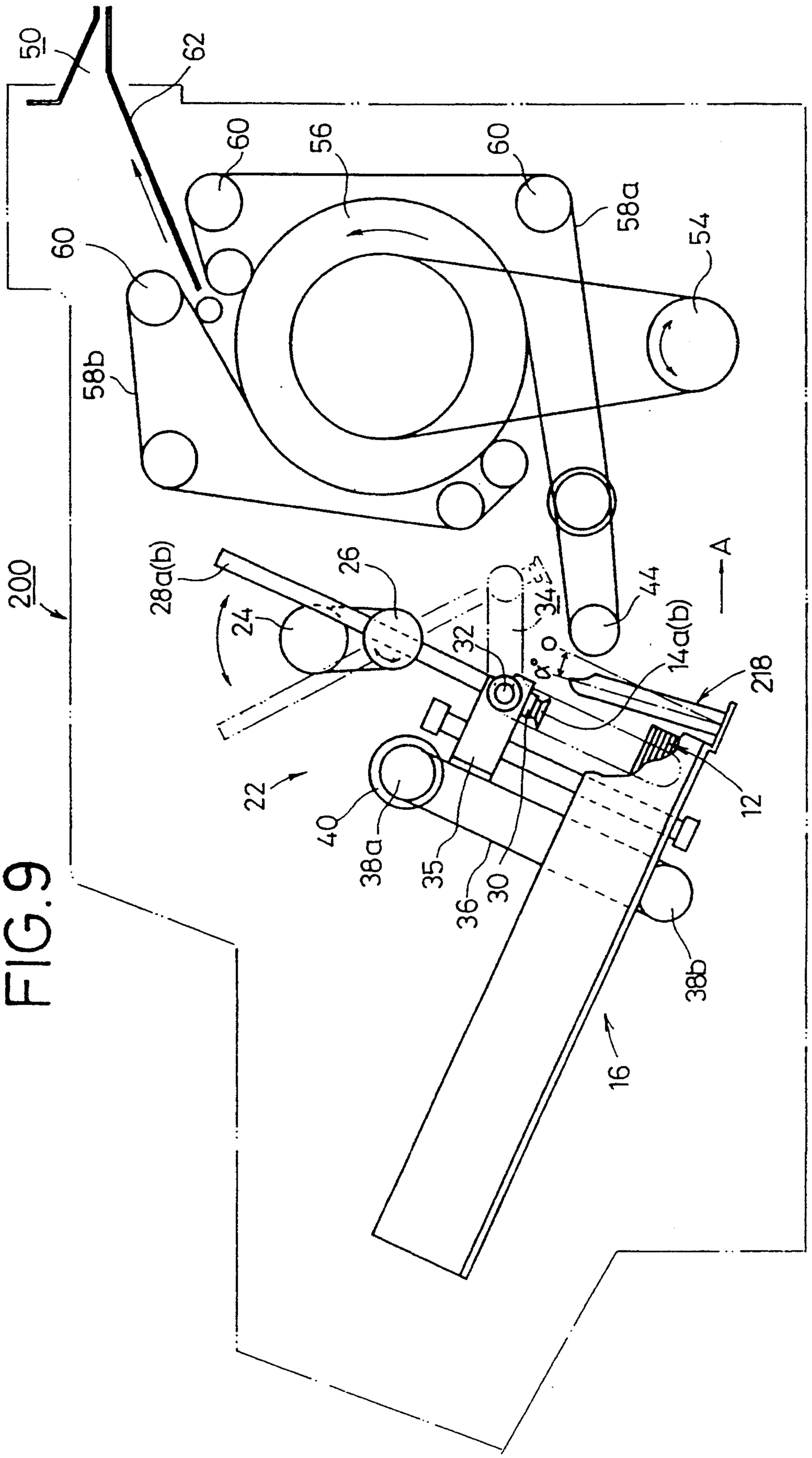


FIG.8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58a
54
60
58b
200
28a(b)
26
24
34
44
A
32
α°
14a(b)
218
22
40
38a
35
36
30
12
16
38b

FIG.9

FIG.10

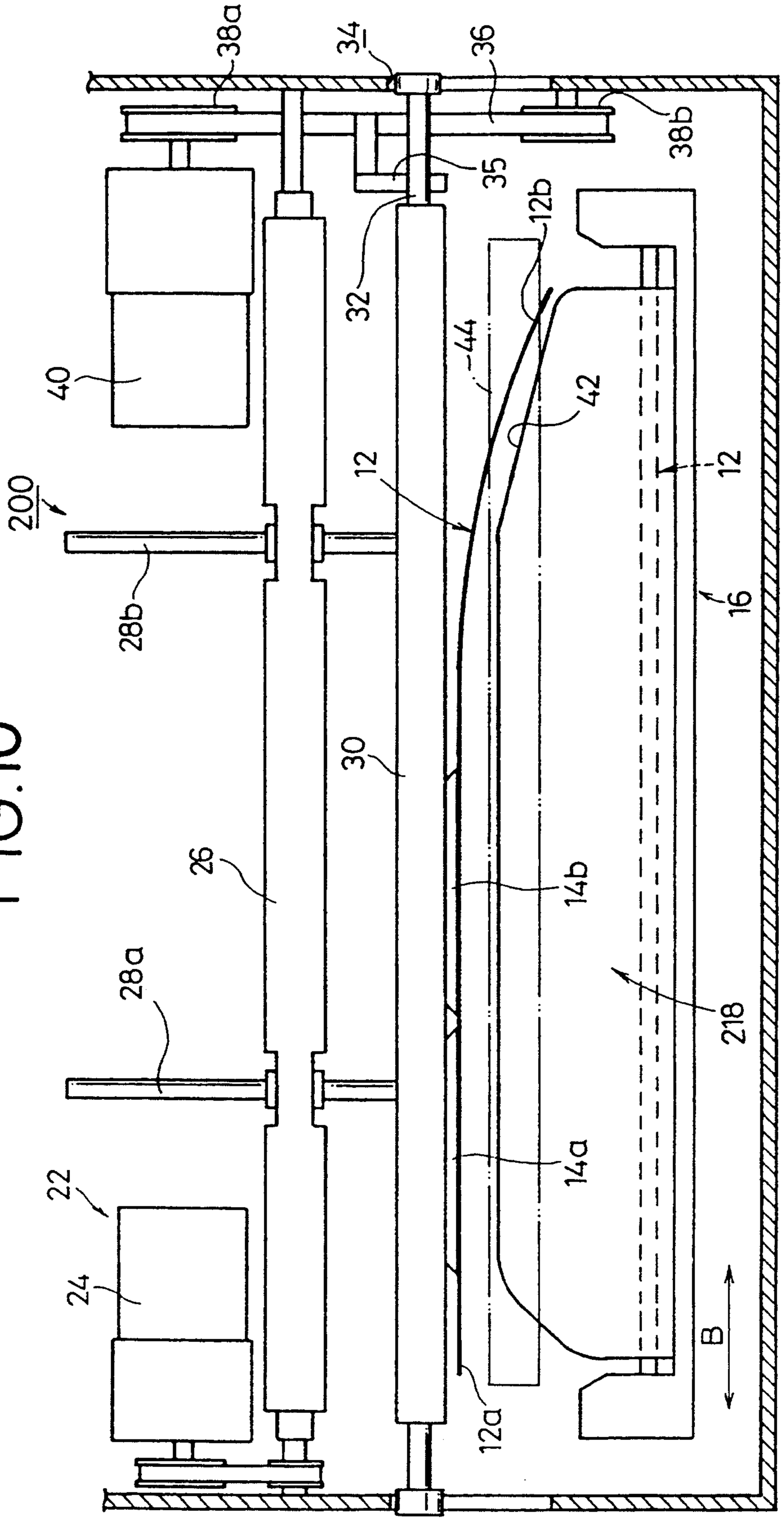

38a
34
36
38b
35
12b
32
44
42
40
12
200
28b
16
26
30
14b
28a
218
22
24
14a
B
12a

FIG.11a

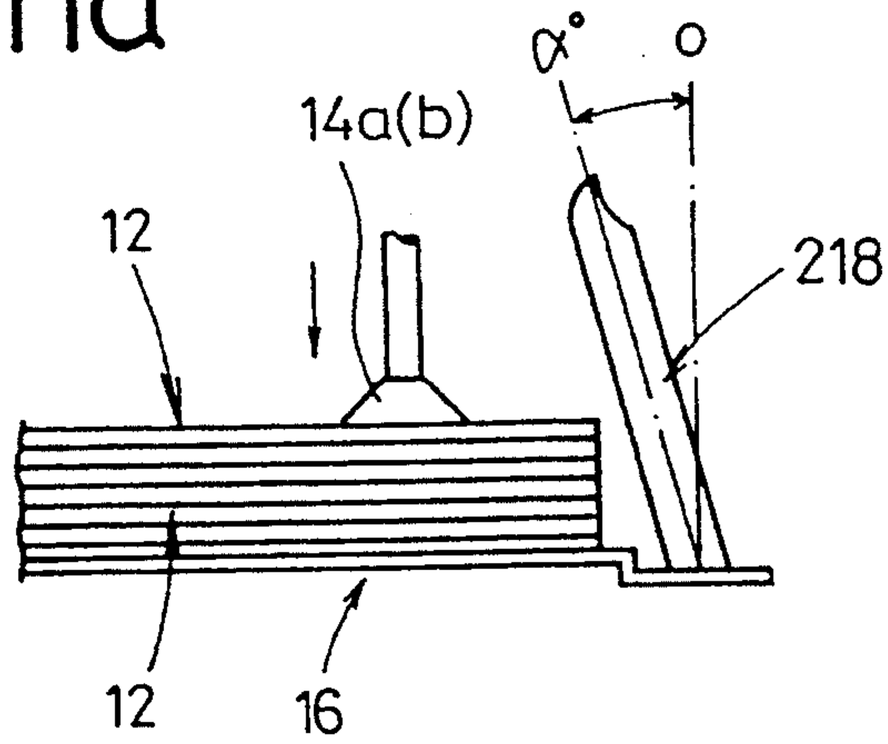


FIG.11b

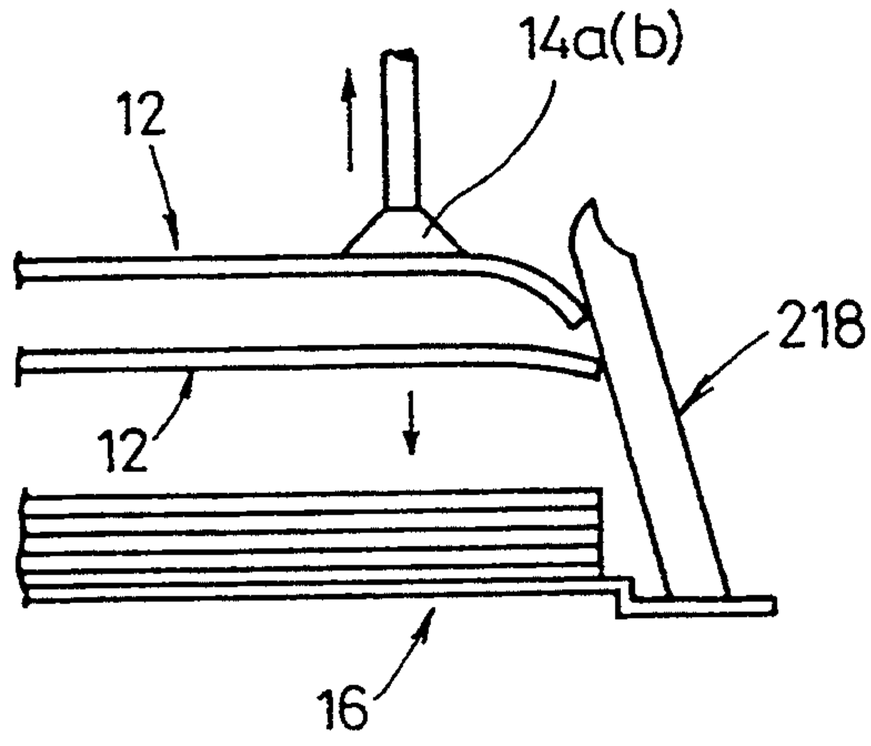
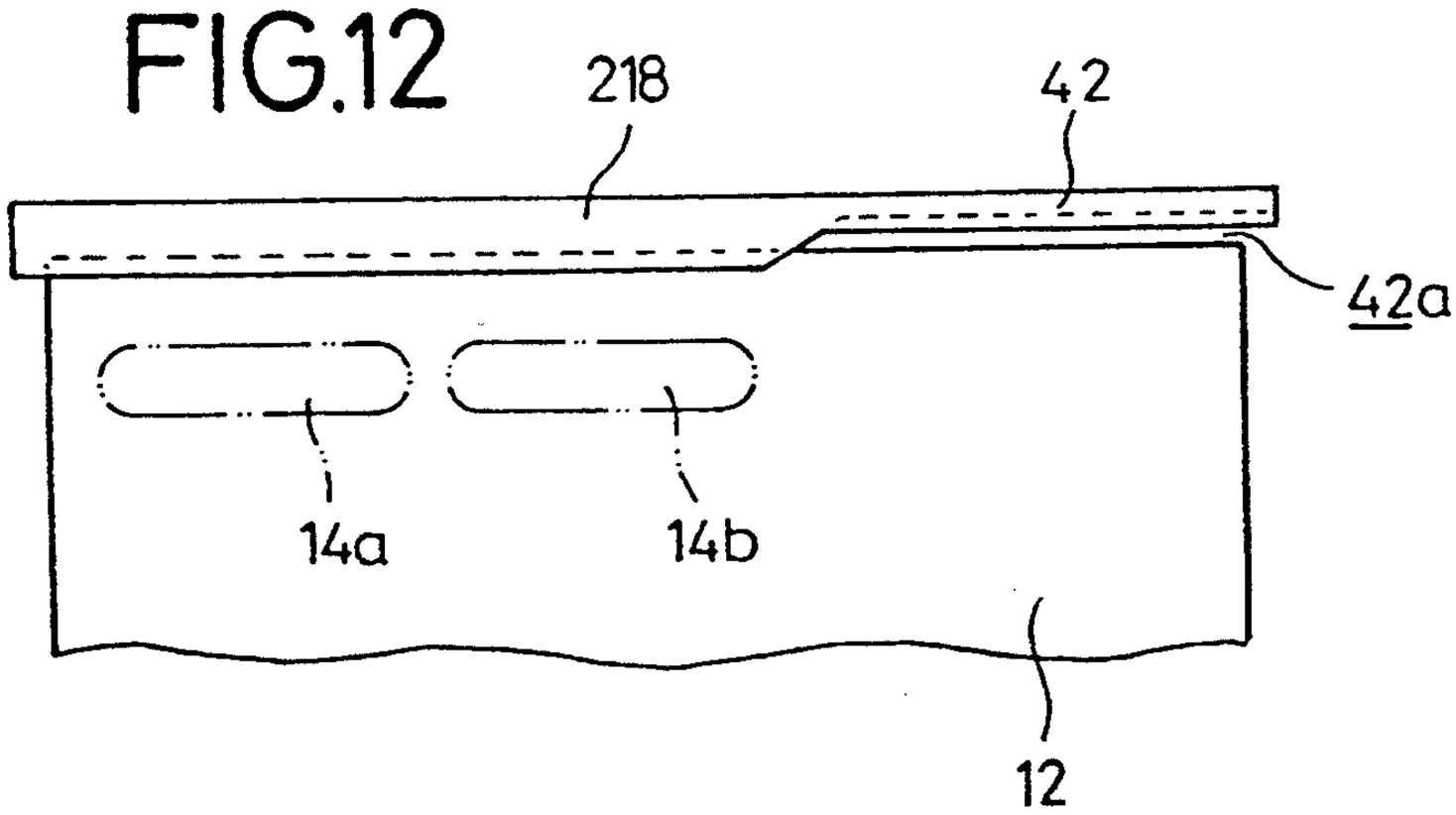


FIG.12



SHEET FEEDING DEVICE

This is a division of application Ser. No. 07/805,945, now U.S. Pat. No. 5,246,220 filed Dec. 12, 1991.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a device for reliably feeding sheets to an automatic photographic processor or the like, one by one, from a stack of sheets.

2. Description of the Related Art

A sheet feeding device has been used to deliver sheets such as unexposed photographic light-sensitive mediums, one by one, from either a supply magazine or a sheet placement table in which the sheets have been stored in a stacked state. The sheets are delivered to an exposure station and after the sheets have been exposed, are fed one by one to a developing machine.

The sheet feeding device is so constructed that a plurality of suction cups or pads (sheet separating means) are positioned to face a sheet stack. The suction pads are pressed against an uppermost sheet of the stacked sheets to hold and remove the uppermost sheet under a suction generated by a vacuum generator.

Different sized sheets such as photographic films are employed for various uses. Such different sized sheets are fed one by one by use of a single sheet feeding device. In this sheet feeding device, one or more suction pads are disposed to face one end of an edge of the uppermost sheet of the sheets so as to meet the smallest sized sheet of the different sized sheets to avoid air leakage that would result when the smallest sized sheet is attracted. Therefore, when a sheet of particularly a large size is employed, the opposite end of the sheet with regard to the suction pads is spaced a long distance away from the suction pads, which results in the sheet hanging due to its own weight or stiffness. Thus, the opposite end of the sheet is brought into contact with an engaging member which holds the stacked sheets on a sheet placement table, thereby creating a failure during sheet feeding or damage to the sheets.

In order to avoid the hanging of the opposite end of the sheet with regard to the suction pads when the uppermost sheet is attracted under suction by the suction pads, the following approaches have heretofore been made. Specifically, a sheet placement table or portion is formed in such a shape that the portion can upwardly tilt the opposite end of the sheet which may hang down. Alternatively, there is located at least one auxiliary suction pad opposing the opposite end of the sheet which may hang down. When sheets of, for example, large size are fed one by one, the auxiliary suction pad is driven to hold the opposite end of the sheet under suction.

In the conventional sheet feeding device, however, a process for loading a plurality of sheets in the sheet placement portion having shape referred to the above is greatly cumbersome, thereby causing the problem that the sheet feeding process as a whole cannot efficiently be carried out.

When the auxiliary suction pad referred to above is provided, the pad must be activated only when the sheets of large size are fed one by one, thereby causing the problem that control of the auxiliary suction pad is complicated and hence its operation efficiency becomes inferior.

In addition to the above problems, there is often a situation in which the stacked sheets adhere firmly to one another. It is therefore necessary to reliably separate only the uppermost sheet from the adjacent lower sheets by suction cups or pads so as to remove the uppermost sheet from the sheet placement portion. To this end, there have heretofore been proposed various approaches. In general, the uppermost sheet attracted by the suction pads is moved along complicated loci or paths to have the sheet turned or swung, thereby preventing a plurality of sheets from being fed simultaneously.

In the conventional sheet feeding device referred to above, however, an extremely complex mechanism is required for turning or swinging the uppermost sheet. Thus, the entire construction of the sheet feeding device becomes complex and the manufacturing cost is rendered high.

There is also a case in which when the lower sheets underneath the uppermost sheet are successfully separated from the uppermost sheet attracted performing the suction pads by sheet turning or swinging action. In this case, however, the lower sheets are held in the sheet successfully removed at times cannot reliably be returned into a sheet placement portion. Therefore, a pressing bar must normally be used, so that the sheet feeding process cannot efficiently be carried out.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to provide a sheet feeding device of a type wherein stacked sheets can reliably be taken out one by one with a simple structure and the entire sheet feeding process can efficiently be carried out.

It is another object of the present invention to provide a device for feeding sheets one by one, the device comprising sheet separating means facing one end of an edge of an uppermost sheet of stacked sheets, for taking out the uppermost sheet, and engaging means disposed in a sheet placement portion, for supporting the leading ends in the withdrawal direction of the stacked sheets, the engaging means including a cut-away portion corresponding to the opposite end of the uppermost sheet being spaced away from the sheet separating means, to prevent the opposite end of the uppermost sheet from contacting with the engaging means due to a hang down of the uppermost sheet.

It is a further object of the present invention to provide a device wherein the cut-away portion slopes down toward the opposite end of the uppermost sheet with regard to the sheet separating means from the one end of the sheet.

It is still a further object of the present invention to provide a device further including sheet position correcting means which is located near the engaging means and also faces at least the cut-away portion.

It is still a further object of the present invention to provide a device wherein the sheet position correcting means comprises a rotatable roller.

It is still a further object of the present invention to provide a device wherein the engaging means includes a cut-away portion formed at the opposite end of the uppermost sheet with respect to the sheet separating means along the direction of the thickness of the engaging means so as to form a space between the uppermost sheet and the engaging means.

It is still a further object of the present invention to provide a device for feeding sheets one by one, the

device comprising sheet separating means for taking out an uppermost one of stacked sheets, and engaging means disposed at a sheet placement portion for supporting the leading ends in the withdrawal direction of the stacked sheets on the portion, the engaging means having at least one air inlet port for introducing air into a space between the uppermost sheet and the next sheet when the uppermost sheet is taken out from the stacked sheets to enable the next sheet to be separated from the uppermost sheet.

It is still a further object of the present invention to provide a device wherein said at least one air inlet port comprises either a groove or a hole.

It is still a further object of the present invention to provide a device wherein said at least one air inlet port comprises a groove and a hole.

It is still a further object of the present invention to provide a device wherein the engaging means includes a cut-away portion corresponding to an end of the side edge of the uppermost sheet, the end being spaced away from the sheet separating means, the cut-away portion being defined to prevent the end of the side edge of the sheet from contacting with the engaging means due to hang down of the uppermost sheet.

It is still a further object of the present invention to provide a device for feeding sheets one by one, the device comprising sheet separating means for taking out an uppermost one of stacked sheets, and engaging means located at a sheet placement portion, for supporting the leading ends in the withdrawal direction of the stacked sheets thereon, the engaging means being disposed in such a way as to be tilted by a given angle toward the side edge of the stacked sheets from the direction perpendicular to the surfaces of the stacked sheets.

It is still a further object of the present invention to provide a device wherein the engaging means includes a cut-away portion corresponding to an end of the side edge of the uppermost sheet being spaced away from the sheet separating means, the cut-away portion being defined to prevent the end of the side edge of the sheet from contacting with the engaging means due a hang down of the uppermost sheet.

The above and other objects, features and advantages of the present invention will become apparent from the following description and the appended claims, taken in conjunction with the accompanying drawings in which preferred embodiments of the present invention are shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view schematically showing the structure of an essential part of a sheet feeding device according to a first embodiment of the present invention;

FIG. **2** is a view schematically illustrating the structure of the sheet feeding device;

FIG. **3** is a plan view as seen in the direction indicated by arrow X of FIG. **1**;

FIG. **4** is a view schematically depicting the structure of an essential part of a sheet feeding device according to a second embodiment of the present invention;

FIG. **5** is a view schematically showing the structure of the sheet feeding device shown in FIG. **4**;

FIG. **6** is a fragmentary plan view illustrating the sheet feeding device shown in FIG. **4**;

FIG. **7** is a view for describing the operation of the sheet feeding device shown in FIG. **4**;

FIG. **8** is a vertical cross-sectional view showing another engaging member employed in the sheet feeding device shown in FIG. **4**;

FIG. **9** is a view schematically showing the structure of a sheet feeding device according to a third embodiment of the present invention;

FIG. **10** is a view schematically illustrating the structure of an essential part of the sheet feeding device shown in FIG. **9**;

FIGS. **11A**, **11B** are views for describing the operation of the sheet feeding device depicted in FIG. **9**; and

FIG. **12** is a fragmentary plan view showing the sheet feeding device illustrated in FIG. **9**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **1** and **2**, numeral **10** indicates a sheet feeding device according to a first embodiment of the present invention. If suction pads were located along the entire side edge of the stacked sheets **12**, a vacuum may be broken due to air leakage that would result when a small sized sheet is attracted. Accordingly, the sheet feeding device **10** comprises suction cups or pads (sheet separating means) **14***a*, **14***b* located so as to face one end **12***a* of the side edge of an uppermost photographic light-sensitive medium **12** in order to remove the uppermost photographic light-sensitive medium **12** from the stack of photographic light-sensitive mediums (sheets) **12**. Also provided is an engaging member **18** located at a sheet placement portion on unit **16**, for supporting the leading end in the withdrawal direction of the stacked photographic light-sensitive mediums **12** (corresponding to the direction indicated by the arrow A in FIG. **2**).

The suction pads **14***a*, **14***b* are displaceable in unison with each other by a drive means **22**. The drive means **22** has a rotative drive source **24**, a rotatable shaft **26** which is coupled to the rotative drive source **24** and guide bars **28***a*, **28***b* which are slidably inserted into the shaft **26**. A holder **30** is fixedly mounted on the guide bars **28***a*, **28***b*, and both ends of a rod **32** fixed to the holder **30** are inserted into substantially L-shaped guide grooves **34**. A movable member **35** is brought into engagement with one end of the rod **32**. The movable member **35** is fixedly mounted on a belt **36**, which is wound between a pair of pulleys **38***a*, **38***b*, wherein the pulley **38***a* is coupled to a rotative drive source **40**.

The suction pads **14***a*, **14***b* are mounted on the holder **30**. The suction pads **14***a*, **14***b* are substantially in elongated rectangular parallelopiped form which extends in the direction (i.e., in the direction indicated by the arrow B in FIG. **1**) normal to the withdrawal direction (i.e., the direction indicated by the arrow A) of an uppermost one of stacked sheets **12**. The suction pads **14***a*, **14***b* communicate with an unillustrated vacuum valve.

The engaging member **18** is an elongated plate-like member extending in the direction indicated by the arrow B, and has a cut-away portion **42** formed at a portion corresponding to the opposite end **12***b* of the uppermost photographic light-sensitive medium **12**, with respect to the suction pads **14***a*, **14***b*. The cut-away portion **42** is being defined to prevent the opposite end **12***b* of the sheet from being brought into contact with the engaging member **18** due to the hang down of the photographic light-sensitive medium **12**. Specifically, the cut-away portion **42** is formed to incline downwardly toward the opposite end **12***b* with respect to the

one end **12***a* of the photographic light-sensitive medium **12** as seen in the direction indicated by the arrow B.

A roller **44**, serving as a sheet position or posture correcting means, which has a width corresponding to the maximum width of the photographic light-sensitive medium **12** extending in the direction indicated by the arrow B, is rotatably disposed near the engaging member **18**.

As shown in FIG. **2**, a delivery mechanism **52** is disposed in the sheet feeding device **10** for delivering an uppermost photographic light-sensitive medium **12** taken from the sheet placement unit **16** to an outlet **50**.

The delivery mechanism **52** has a large-diameter drum **56** rotated by a rotative drive source **54**. The drum **56** has an outer peripheral surface which contacts a first belt **58***a* and a second belt **58***b*, which are wound around a plurality of rollers **60**. A guide plate **62** is disposed near the outlet **50**, and the uppermost photographic light-sensitive medium **12** is guided by the plate **62** and transported from the outlet **50** to an unillustrated automatic photographic processor or the like.

The operation of the sheet feeding device constructed as described above will now be described below.

When a plurality of stacked photographic light-sensitive mediums **12** are loaded in the sheet placement unit **16** in the sheet feeding device **10**, the photographic light-sensitive mediums **12** slide on the bottom plate of the sheet placement unit **16**, and the leading ends of the stacked light-sensitive mediums **12** are brought into abutment against the engaging member **18** to be supported by the engaging member **18**.

The rotative drive source **40** of the drive means **22** is energized to cause the pulleys **38***a*, **38***b* and the belt **36** to displace the rod **32** toward the uppermost photographic light-sensitive medium **12** along the guide grooves **34**. Then, the suction pads **14***a*, **14***b* start to suck an uppermost photographic light-sensitive medium **12** at a predetermined position, and attract and hold the uppermost photographic light-sensitive medium **12** under suction.

Then, the rotative drive source **40** is reversed to elevate the rod **32** along the guide grooves **34**, such that the uppermost photographic light-sensitive medium **12** which has been attracted and held by the suction pads **14***a*, **14***b* is separated from a photographic light-sensitive medium below the uppermost light-sensitive medium **12** and only the uppermost photographic light-sensitive medium **12** is removed from the stacked photographic light-sensitive medium **12**. When the rod **32** reaches the corner of the guide grooves **34**, the rotative drive source **40** is de-energized, and the rotative drive source **24** is energized to rotate the rotatable shaft **26**, and the rod **32** is turned in a given angular range (see the two-dot chain line in FIG. **2**). As a consequence, the uppermost photographic light-sensitive medium **12** which has been attracted and held by the suction pads **14***a*, **14***b* is delivered to the delivery mechanism **52**.

When the suction pads **14***a*, **14***b* are inactivated, the uppermost photographic light-sensitive medium **12** is released. The rotative drive source **54** of the delivery mechanism **52** is energized to rotate the drum **56** in the direction indicated by the arrow, and the uppermost photographic light-sensitive medium **12** is transported to a given angular position by means of the drum **56**, the first belt **58***a* and the second belt **58***b*. Then, the rotative drive source **54** is energized to rotate the drum **56** in the direction opposite to the direction indicated by the arrow, and the photographic light-sensitive medium **12** supported on the drum **56** is delivered from the outlet **50** to an automatic photographic processor or the like guided by the guide plate **62**.

The suction pads **14***a*, **14***b* are located so as to face the one end **12***a* of the leading end of the uppermost photographic light-sensitive medium **12**. Therefore, when a photographic light-sensitive medium **12** of particularly a large size, is used (see FIG. **1**), the opposite end **12***b* of the photographic light-sensitive medium **12** is spaced away from the suction pads **14***a*, **14***b*. Therefore, the opposite end **12***b* of the photographic light-sensitive medium **12** tends to sag or hang down due to its own weight or stiffness when the large-sized photographic light-sensitive medium **12** is attracted and held by the suction pads **14***a*, **14***b*.

In the present embodiment, the cut-away portion **42** on the engaging member **18** is designed to form a slant face to meet the degree of hang down of the opposite end **12***b* of the photographic light-sensitive medium **12**. Thus, even if the opposite end **12***b* of the photographic light-sensitive medium **12** hangs down as shown in FIG. **1**, the opposite end **12***b* cart reliably be prevented from being brought into contact with the engaging member **18**, so that photographic light-sensitive mediums **12** of different size can efficiently and reliably be separated and fed one by one to a desired station.

It is also possible to avoid a cumbersome process when photographic light-sensitive mediums **12** are loaded on a slant sheet placement portion. Further, it is possible to avoid difficulties in operation or, complexity of control when auxiliary suction pads are used to attract only a large-sized photographic light-sensitive medium **12**.

As shown in FIG. **3**, it is desirable that a recess portion **42***a* be formed in a direction of the thickness of the engaging member **18** at an end opposite to the suction pads **14***a*, **14***b*. Thus, when the suction pads **14***a*, **14***b* attract and hold the uppermost photographic light-sensitive medium **12** and lifts the same upwardly, the elevation of the uppermost photographic light-sensitive medium **12** is not prevented due to the photographic light-sensitive medium **12** contacting the inner wall surface of the engaging member **18**. The recess portion **42***a* may be formed at a position spaced away from the suction pads **14***a*, **14***b*. The depth of the recess portion **42***a*, for example, is about 4 mm, in the direction of the thickness of the engaging member **18** (the thickness of the engaging member **18** is about 10 mm).

After the large-sized photographic light-sensitive medium **12** referred to above is attracted by the suction pads **14***a*, **14***b* and taken out from the sheet placement unit **16**, the position or posture of the opposite end **12***b* which is not sucked by the suction pads **14***a*, **14***b* and is hanging down, is corrected by the roller **44** to enable the light-sensitive medium **12** to reliably feed toward the delivery mechanism **52**.

In the present embodiment, the photographic light-sensitive medium **12** on which images have been exposed are fed to the automatic photographic processor. However, the present embodiment can also be applied to an example where unexposed photographic light-sensitive mediums **12** are fed one by one to an image recording device.

A sheet feeding device according to a second embodiment of the present invention will now be described below in detail with reference to the accompanying drawings. The same elements and structure as employed in the sheet feeding device according to the first embodiment are denoted by the same reference

numerals, and their detailed description will therefore be omitted.

Referring to FIGS. **4** and **5**, numeral **100** denotes the sheet feeding device according to the second embodiment. An engaging member **118** of the sheet feeding device **100** is an elongated plate-like member extending in the direction indicated by the arrow B. As shown in FIG. **6**, the engaging member **118** has a recess portion **42**a formed at a position opposite to suction pads **14***a*, **14***b* in order to form a given space between the leading end of the uppermost photographic light-sensitive medium **12** and the engaging member **118**. It is thus possible to avoid any failure in sheet feeding operation, due to the contact of the leading end of the photographic light-sensitive medium **12** with the engaging member **118** when the suction pads **14***a*, **14***b* attract and hold a large-sized photographic light-sensitive medium **12** and lifts the same upwardly. More specifically, for example, the thickness of the engaging member **118** is about 10 mm, and the depth of the recess portion **42***a* is about 4 mm. Further, the engaging member **118** has a cut-away portion **42** formed at a portion corresponding to the opposite end **12***b* to the suction pads **14***a*, **14***b* of the uppermost photographic light-sensitive medium **12**, where the opposite end **12***b* is spaced away from the suction pads **14***a*, **14***b*, so that the cut-away portion **42** can prevent the leading end of the photographic light-sensitive medium **12** from contacting the engaging member **118** due to the hang down of the photographic light-sensitive medium **12** (see FIG. **4**).

The engaging member **118** has holes (air inlet ports) **120***a*, **120***b* along the longitudinal direction of the engaging member **118** (i.e., along the direction indicated by the arrow B) in a plurality of rows holes. In the embodiment, a pair of the holes **120***a*, **120***b* are formed in upper and lower position, but, the number of the holes can be changed as needed.

The operation of the sheet feeding device **100** as described above will now be described. The operation common to that of the aforementioned sheet feeding device **10** will not be described.

When a plurality of photographic light-sensitive mediums **12** are first loaded in the sheet placement unit **16**, the uppermost photographic light-sensitive medium **12** is attracted under suction by the suction pads **14***a*, **14***b* of a drive means **22** so as to upwardly remove the sheet from the sheet placement unit **16**.

In the second embodiment, the engaging member **118** has a plurality of rows of holes **120***a*, **120***b*, where air is introduced from the holes **120***a*, **120***b* between the uppermost photographic light-sensitive medium **12** and the next photographic light-sensitive medium **12** when the uppermost photographic light-sensitive medium **12** attracted by the suction pads **14***a*, **14***b* is lifted (see FIG. **7**). Accordingly, the adhesion of the uppermost photographic light-sensitive medium **12** to the next photographic light-sensitive medium **12** can be effectively prevented. Consequently, the next photographic light-sensitive medium **12** can reliably be separated from the uppermost photographic light-sensitive medium **12**, thereby making it possible to prevent a plurality of photographic light-sensitive mediums from being fed simultaneously. This can eliminate the necessity of the so-called swing motion of the photographic light-sensitive medium as required in the conventional devices. Thus, the entire construction of the sheet feeding device **100** can be simplified by adopting an extremely-simplified structure in such a way that the holes **120***a*, **120***b* are formed in the engaging member **118**.

In the present embodiment, the next photographic light-sensitive medium **12** is separated from the uppermost photographic light-sensitive medium **12** by air which is introduced from the holes **120***a*, **120***b* of the engaging member **118**. However, the uppermost photographic light-sensitive medium **12** may be separated from the next and lower photographic light-sensitive mediums **12** by forcibly introducing air from the holes **120***a*, **120***b* into spaces defined among the stacked photographic light-sensitive mediums **12** as indicated by the arrows Y in FIG. **7**.

The holes **120***a*, **120***b*, which function air inlet ports, are formed on a flat side wall of the engaging member **118**. However, an engaging member **180** as shown in FIG. **8** may be used to separate more reliably the uppermost photographic light-sensitive medium **12** from the next photographic light-sensitive medium **12**.

The engaging member **180** has concave-convex shaped grooves **182** formed on at the inner surface of the side wall with which the stacked photographic light-sensitive mediums **12** are brought into contact along with a plurality of holes **184** formed in the side wall of the engaging member **180**. Accordingly, air is smoothly introduced from the grooves **182** and the holes **184** of the engaging member **180** into a space between the uppermost photographic light-sensitive medium **12** attracted and lifted upwardly by the suction pads **14***a*, **14***b* as described above and the next photographic light-sensitive mediums **12**, thereby making it possible to separate more reliably the adjacent lower photographic light-sensitive medium **12** from the uppermost photographic light-sensitive medium **12**.

Further, a plurality of grooves extending in the direction of the stacked photographic light-sensitive mediums **12** (i.e., in the vertical direction in FIG. **7**) may be formed in the engaging member **180** so that the grooves can be used as air inlet ports.

A sheet feeding device according to a third embodiment of the present invention will now be described below in detail with reference to the accompanying drawings. The same elements of structure as those employed in the sheet feeding device according to the first embodiment are denoted by the same reference numerals, and will not be described in detail.

Referring to FIGS. **9** and **10**, designated at numeral **200** is the sheet feeding device according to the third embodiment. An engaging member **218** of the sheet feeding device **200** is an elongated plate-like member extending in the direction indicated by the arrow B. In addition, the engaging member **218** has a cut-away portion **42** formed in a portion corresponding to the opposite end **12***b* of the uppermost photographic light-sensitive medium **12**, which is spaced away from the suction pads **14***a*, **14***b*. The cut-away portion **42** can prevent the leading end of the uppermost photographic light-sensitive medium **12** from contacting with the engaging member **218** due to a hang down of the photographic light-sensitive medium **12**. Specifically, the cut-away portion **42** is formed in such a way that the photographic light-sensitive medium **12** is inclined downwardly toward the opposite end **12***b* from one end **12***a* of the photographic light-sensitive medium **12** as seen in the direction indicated by the arrow B.

As shown in FIG. **12**, the engaging member **218** has a space **42***a* at one end of the side of the stacked light-sensitive mediums **12** at a position spaced away from the

suction pads **14***a*, **14***b*. Thus, any failure in sheet feeding motion, due to contact between a large-sized photographic light-sensitive medium **12** and the engaging member **218**, can be prevented.

The engaging member **218** is tilted by a predetermined angle $\alpha°$ toward the stacked photographic light-sensitive mediums **12** from the direction (see the long and short dash line o in FIG. **9**) normal to the back surfaces (or front surfaces) of the stacked photographic light-sensitive mediums **12** stored in the sheet placement unit **16**. The angle $\alpha°$ may be selected in an angular range of 0.5° or greater, however, the angle $\alpha°$ will preferably be selected from a range of 1°–3°.

The operation of the sheet feeding device **200** constructed as described above will now be described below. The operation common to that of the aforementioned sheet feeding device **10** will not be described.

When a plurality of stacked photographic light-sensitive mediums **12** are first loaded in the sheet placement unit **16** in the sheet feeding device **200**, the suction pads **14***a*, **14***b* of the drive means **22** attract the uppermost photographic light-sensitive medium **12**, so as to upwardly remove the sheet from the sheet placement unit **16**. (see FIGS. **11***a* and **11***b*).

In the third embodiment, the engaging member **218** for supporting the leading end in the withdrawal direction of the photographic light-sensitive mediums **12** is tilted by the predetermined angle $\alpha°$ toward the photographic light-sensitive mediums **12** from the direction normal to the back surface (or front surface) of photographic light-sensitive mediums **12**. Therefore, the leading end of the uppermost photographic light-sensitive medium **12** attracted by the suction pads **14***a*, **14***b* is brought into contact with the engaging member **218** while being moved upwardly, so that its leading end is forcibly flexed (see FIG. **11***b*). Thus, even if the uppermost photographic light-sensitive medium **12** and the adjacent lower photographic light-sensitive mediums **12** adhere firmly, the adjacent lower photographic light-sensitive mediums **12** can reliably be separated from the uppermost photographic light-sensitive medium **12**, thereby making it possible to prevent a plurality of photographic light-sensitive mediums from being fed, simultaneously. This can eliminate the so-called swing motion of photographic light-sensitive medium as preferred in conventional device. The entire construction of the sheet feeding device **200** can also be simplified by adopting an extremely-simplified structure in such a way that the engaging member **218** is tilted by a predetermined angle.

Since the lower end of the engaging member **218** is spaced away from the stacked photographic light-sensitive mediums **12**, the next and lower photographic light-sensitive mediums **12** thus separated can reliably be returned in the sheet placement unit **16** without interfering with the engaging member **218**. It is thus possible to eliminate an unnecessary process for returning unwanted photographic light-sensitive mediums to a sheet placement unit by using a pressing bar as in the conventional method. In addition damage of the lower photographic light-sensitive mediums caused by lowering suction pads when the lower photographic light-sensitive mediums are caught by the engaging member **218** can be prevented so that the photographic light-sensitive mediums are efficiently and smoothly separated and fed.

As has been described above, the sheet feeding device according to the present invention can bring about the following advantageous effects. In the present invention, a sheet separating means is activated to attract and hold one end of the edge of the uppermost sheet, to remove the uppermost sheet from a sheet placement unit in a state in which the leading end in the withdrawal direction of each of stacked sheets is being supported by an engaging member. The end of the sheet opposite from the separating means, tends to hang down due to the weight of the sheet give that the opposite end of a sheet is spaced away from the sheet separating means. However, since a cut-away portion facing the opposite end of the sheet is formed at the engaging member, the contact between opposite end of the sheet and the engaging member is reliably prevented. Accordingly, sheets of different sizes can reliably and efficiently be fed one by one with a simple construction, and the sheets can be handled with great ease.

According to the sheet feeding device of the present invention, another advantageous effect results when a sheet separating means is operated to remove the uppermost sheet from a sheet placement portion in a state in which the leading end in the withdrawal direction of stacked sheets is supported by an engaging member, where air is introduced from air inlet ports into a space between the uppermost sheet and the lower adjacent sheet, thereby making it possible to reliably and easily separate the lower adjacent sheets from the uppermost sheet. It is therefore unnecessary to use a sheet feeding device having a complex structure for swinging the uppermost sheet, thereby making it possible to simplify the entire structure of the sheet feeding device.

According to the sheet feeding device, another advantageous effect results when a sheet separating means is used to remove the uppermost sheet from a sheet placement portion in a state in which the leading end in the withdrawal direction of the stacked sheets is supported by an engaging member, where the leading end of the uppermost sheet attracted by the sheet separating means is brought into contact with the engaging member to be forcibly flexed because the engaging member is tilted by a given angle. Specifically, the engaging member is tilted toward the stacked sheets from the direction normal to the upper surface of the stack, so that the uppermost sheet can be reliably and easily separated from the lower adjacent sheets. It is therefore unnecessary to employ a sheet feeding device having a complex structure for swinging the uppermost sheet thereby making it possible to simplify the entire structure of the sheet feeding device. Further, since the lower end of the engaging member is spaced away from the stacked sheets, the lower sheets thus separated can reliably be returned to the sheet placement portion without restraining the sheets from moving toward the sheet placement portion thereby making it possible to efficiently and easily feed the stacked sheets one by one.

Having now fully described the invention, it will be apparent to those skilled in the art that many changes and modifications can be made without departing from the spirit or scope of the invention as set forth herein.

What is claimed is:

1. A device for feeding sheets one by one, said device comprising:

sheet separating means disposed facing a first end of a leading edge in the withdrawal direction of an uppermost sheet of stacked sheets, for taking out the uppermost sheet; and

engaging means located at a sheet placement portion, for supporting the leading edges in the withdrawal

direction of said stacked sheets, said engaging means having a cut-away portion facing a second end of the leading edge of the uppermost sheet, said second end being on an opposite side of the uppermost sheet with respect to said first end, said second end being spaced away from said sheet separating means, said cut-away portion being formed to prevent the second end of the uppermost sheet from contacting said engaging means due to hang down of the uppermost sheet.

2. A device according to claim **1**, wherein said cut-away portion is formed in such a manner as to be tilted downwardly in the direction towards the second end of the uppermost sheet away from the sheet separating means.

3. A device according to claim **1**, further including sheet position correcting means disposed near said engaging means and positioned to face at least said cut-away portion.

4. A device according to claim **3**, wherein said sheet position correcting means comprises a rotatable roller.

5. A device according to claim **1**, wherein said engaging means further includes a recess formed at a portion facing the second end of the uppermost sheet along the direction of the thickness of said engaging means, so as to form a space between the uppermost sheet and said engaging means.

6. A device according to claim **1**, wherein said engaging means is tilted by a given angle toward said stacked sheets from the direction normal to the surfaces of said stacked sheets.

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